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PATENT APPLICATION

ATTORNEY DOCKET NO. 10991149-2

IN THE
UNITED STATES PATENT AND TRADEMARK OFFICE

Inventor(s): Qiming Chen, et al.

Confirmation No.: 7356

Application No.: 09/464,311

Examiner: A. Robinson Boyce

Filing Date: 12/15/1999

Group Art Unit: 3623

Title: Customer Profiling Apparatus for Conducting Customer Behavior Pattern Analysis, and Method for Comparing Customer Behavior Patterns

Mail Stop Appeal Brief-Patents
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TRANSMITTAL OF APPEAL BRIEF

Sir:

Transmitted herewith is the Appeal Brief in this application with respect to the Notice of Appeal filed on **March 9, 2005**.

The fee for filing this Appeal Brief is (37 CFR 1.17(c)) $500.00.

(complete (a) or (b) as applicable)

The proceedings herein are for a patent application and the provisions of 37 CFR 1.136(a) apply.

( ) (a) Applicant petitions for an extension of time under 37 CFR 1.136 (fees: 37 CFR 1.17(a)-(d) for the total number of months checked below:

( )	one month	$120.00
( )	two months	$450.00
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( ) The extension fee has already been filled in this application.

(X) (b) Applicant believes that no extension of time is required. However, this conditional petition is being made to provide for the possibility that applicant has inadvertently overlooked the need for a petition and fee for extension of time.

Please charge to Deposit Account **08-2025** the sum of **$500.00**. At any time during the pendency of this application, please charge any fees required or credit any over payment to Deposit Account 08-2025 pursuant to 37 CFR 1.25. Additionally please charge any fees to Deposit Account 08-2025 under 37 CFR 1.16 through 1.21 inclusive, and any other sections in Title 37 of the Code of Federal Regulations that may regulate fees. A duplicate copy of this sheet is enclosed.

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Respectfully submitted,

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PATENT APPLICATION
DOCKET NO. 10991149-2

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE
BOARD OF PATENT APPEALS AND INTERFERENCES

INVENTOR(S): Qiming Chen, et al.

SERIAL NO.: 09/464,311 **GROUP ART UNIT:** 3623

FILED: December 15, 1999 **EXAMINER:** A.K. Robinson Boyce

SUBJECT: "Customer Profiling Apparatus for Conducting Customer Behavior Pattern Analysis, and Method for Comparing Customer Behavior Patterns"

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SIR:

APPEAL BRIEF

Appellant is appealing from the Final Rejection of claims 1, 3-4, 6-7, 9-11, 16-22, and 25-32 in an Office Action dated September 15, 2004. This brief is being filed as required by 37 C.F.R. § 41.37(a). Please charge the required fee in the amount of $500.00 specified under 37 C.F.R. § 41.20(b)(2) for filing this Appeal Brief to PTO Deposit Account No. 08-2025.

Real Party In Interest

The real party in interest is Hewlett-Packard Company.

Related Appeals and Interferences

There are no other appeals which will directly affect or be directly affected by or have a bearing on the Board's decision in the pending appeal.

Status of Claims

Claims 1, 3-4, 6-7, 9-11, 16-22, 25-32 are pending. No claims have been allowed. All of claims 1, 3-4, 6-7, 9-11, 16-22, and 25-32 stand finally rejected. The claims appealed are claims 1, 3-4, 6-7, 9-11, 16-22, and 25-32.

Status of Amendments

No amendments were filed subsequent to the final rejection of September 15, 2004. In an Advisory Action of December 1, 2004, the Examiner indicated that for purposes of appeal, the After Final response filed on November 15, 2004 would be entered. The response filed November 15, 2004 does not amend the claims or specification.

Summary of Claimed Subject Matter

Claim 1 includes the subject matter of a customer profiling apparatus for conducting customer telephone behavior pattern analysis on telephone call recordings including telephone call data (see page 4, lines 7-11). Processing circuitry 32 (see Fig. 1) is operative to process customer telephone call records 50 (see Fig. 1). A data warehouse 46 (see Fig. 1 and page 4, lines 9-10) is coupled with the processing circuitry and is configured to store the processed customer telephone call records 50 (see Fig. 1). An OLAP-based scalable profiling engine 16 communicates with the data warehouse 46 and is operative to build and update customer behavior profiles 44 (see Fig. 1) by mining the customer telephone call records 50 (see Fig. 1) that flow into the data warehouse 46 (see page 4, lines 10-22). At least one computer program 48 (see page 7, line 29) is performed by the profiling engine and is operative to define behavior profiles defined at least in part by probability distributions, using data from the telephone call records, as data cubes 42 (see Fig. 1) and derived similarity measures on patterns extracted from the behavior profiles.

Furthermore, the behavior profiles are provided as two input calling pattern cubes C_1 and C_2, and a similarity cube, C_s, is an output of a comparison between C_1 and C_2, wherein the similarity cube, C_s, represents a pair of corresponding sub-cubes of C_1 and C_2 (see page 23, lines 9-32, through page 24, lines 1-43, and page 31, lines 6-33, through page 32, lines 1-7). Additionally, C_1 and C_2 are count-cubes, a sub-cube is treated as a bag, and cell-wise comparison results are summarized based on bag overlap, the count-cubes have non-negative integer cell values, and the bag overlap enables comparison of corresponding sub-cubes of distinct count-cubes (see page 14, lines 21-28, and page 15, line 15-27).

Claim 11 includes the subject matter of a profiling apparatus (see page 4, lines 7-11) having a data warehouse 46 (see Fig. 1 and page 4, lines 9-10), a profiling engine 16 (see Fig. 1 and page 8, line 7), and a computer application program 48 (see page 7, line 29). The profiling engine 16 is configured to communicate with the data warehouse 46 and is operative to generate customer telephone calling behavior profiles 44 (see Fig. 1) from the customer records 50 (see Fig. 1) within the data warehouse 46 (see Fig. 1 and page 4, lines 9-10), the profiling engine 16 being configured to define customer telephone calling behavior profiles 44 (see Fig. 1) using probability distributions, and to compute the customer telephone calling behavior profiles using OLAP operations on multi-dimensional and multi-level data cubes 42 (see Fig. 1), one multi-level data cube being a profile cube 76 (see page 28, line 29), another multi-level data cube being a profile-snapshot cube 74 (see page 28, line 22), and yet another data cube being a profile cube 78 (see page 29, line 2) formed by merging together the profile cube and the profile-snapshot cube. The computer application program 48 is implemented on the profiling engine 16 and is operative to represent behavior profiles as patterns, using the telephone call data, and derive similarity measures of the patterns usable to profile customer behavior and detect fraud by deriving calling pattern cubes from the profile cubes using a probability distribution-based calling pattern (see page 23, lines 9-32, through page 24, lines 1-43, and page 31, lines 6-33, through page 32, lines 1-7), treating a sub-cube as a bag, and summarizing cell-wise comparison

results based on bag overlap (see page 14, lines 21-28, and page 15, lines 15-27).

Claim 17 includes a method for comparing customer behavior patterns. The method comprises providing call data in the form of call data records 50 (see Fig. 1) to a data warehouse 46 (see page 4, lines 10-22); loading the call data records into a multidimensional database of an OLAP server 14 (see Fig. 1); maintaining profiles by staging data between the data warehouse and the OLAP multidimensional database; generating a profile-snapshot cube 74 (see page 28, line 22) accommodating multiple customers; in combination with generating the profile-snapshot cube, generating a profile cube 76 (see page 28, line 29) for the same set of customers from the data warehouse; updating the profile cube by merging the profile cube with the profile-snapshot cube; storing the updated profile cube 78 (see page 29, line 2) in the data warehouse; and deriving similarity measures of patterns usable to profile customer behavior and detect fraud by deriving calling pattern cubes from the updated profile cube using a probability distribution-based calling pattern (see page 23, lines 9-32, through page 24, lines 1-43, and page 31, lines 21-28, through page 32, lines 1-7), treating a sub-cube as a bag, and summarizing cell-wise comparison results based on bag overlap (see page 3, lines 1-9; page 8, lines 1-10; page 14, lines 21-28; page 15, lines 15-27; and page 38, lines 8-24).

Claim 21 includes the subject matter of claim 17, described above, in addition to subdividing the updated profile cube into a plurality of individual calling pattern cubes (see page 35, lines 1-30, through page 36, lines 1-30), each representative of individual customers, and further comprising comparing calling patterns that have been derived from customer calling behavior profiles, and further including retrieving profile tables to generate the profile cubes, retrieving call data tables to create profile-snapshot cubes (see page 30, lines 1-26) that have a same dimension of a profile cube to facilitate merging by addition, deriving individual customer-based calling pattern cubes from the profile cubes, analyzing individual calling patterns in multiple dimensions and multiple levels, and computing a similarity of calling patterns that belong to

different customers or to a same customer over different profiling periods (see page 30, lines 1-26).

Claim 25 includes the subject matter of a profiling apparatus (see page 4, lines 7-11). The profiling apparatus includes a data warehouse 46 (see Fig. 1 and page 4, lines 9-10), a profiling engine 16 (see Fig. 1), and a computer application program 48 (see page 7, line 29). The data warehouse 46 is configured for storing customer records 50 (see Fig. 1) including telephone call data. The profiling engine is configured to communicate with the data warehouse 46 (see page 4, lines 10-22) and is operative to generate customer telephone calling behavior profiles 44 (see Fig. 1) from the customer records within the data warehouse 46. The profile engine 16 is configured to define customer telephone calling behavior profiles using probability distributions, and to compute the customer telephone calling behavior profiles using OLAP operations on multi-dimensional and multi-level data cubes 42 (see Fig. 1). One multi-level data cube is a profile cube 76 (see page 28, line 29). Another multi-level data cube is a profile-snapshot cube 74 (see page 28, line 22). Yet another data cube is a profile cube 78 (see page 29, line 2) formed by merging together the profile cube and profile-snapshot cube. A computer application program 48 (see page 7, line 29) is implemented on the profiling engine and is operative to represent behavior profiles as patterns, using the telephone call data, and derive similarity measures of the patterns usable to profile customer behavior and detect fraud by deriving volume-based calling pattern cubes comprising count-cubes (see page 14, lines 21-29) from the profile cubes using a probability distribution-based calling pattern, treating a sub-cube as a bag, and summarizing cell-wise comparison results based on bag overlap using cell-to-subcube mapping. The count-cubes have non-negative integer cell values, and the bag overlap enables comparison of corresponding sub-cubes of distinct count-cubes (see page 14, lines 21-28, and page 15, lines 15-27).

Claim 28 includes the subject matter of a customer profiling apparatus for conducting customer telephone behavior pattern analysis on telephone call records including telephone call data (see page 4, lines 7-11). Processing circuitry 32 (see Fig. 1) is operative to process customer telephone call records 50 (see Fig. 1). A data warehouse 46 (see Fig. 1 and page 4, lines

9-10) is coupled with the processing circuitry and configured to store the processed customer telephone call records 50 (see Fig. 1). An OLAP-based scalable profiling engine communicates with the data warehouse 46 and is operative to build and update customer behavior profiles 44 (see Fig. 1) by mining the customer telephone call records 50 (see Fig. 1) that flow into the data warehouse 46 (see page 4, lines 10-22). At least one computer program 48 (see page 7, line 29), performed by the profiling engine, and operative to define behavior profiles defined at least in part by probability distributions, using data from the telephone call records, as data cubes 42 (see Fig. 1) and derive similarity measures on patterns extracted from the behavior profiles. The behavior profiles are provided as two input calling pattern cubes, and a similarity cube, C_s, is an output of a comparison between C_1 and C_2, wherein the similarity cube, C_s, represents a pair of corresponding sub-cubes of C_1 and C_2 (see page 23, lines 9-32, through page 24, lines 1-43, and page 31, lines 6-33, through page 32, lines 1-7), and wherein C_1 and C_2 are count-cubes (see page 14, lines 21-29), a sub-cube is treated as a bag, and cell-wise comparison results are summarized based on bag overlap, wherein each cell of C_s represents the similarity of a pair of corresponding sub-cubes, a cube having a set of dimensions and each cell of the cube being identified by a value from each of the dimensions (see page 14, lines 21-28, and page 15, lines 15-27).

Grounds of Rejection to be Reviewed on Appeal

Whether or not claims 1, 3, 4, 6, 7, 9-11, 16-22, and 25-32 are patentable under 35 U.S.C. § 1.03(a) over U.S. Patent No. 6,526,389 to *Murad et al.*, in view of U.S. Patent No. 6,115,693 to *McDonough et al.*

Argument

Issue

Claims 1, 3, 4, 6, 7, 9-11, 16-22, and 25-32 are patentable under 35 U.S.C. § 1.03(a) over U.S. Patent No. 6,526,389 to *Murad et al.*, in view of U.S. Patent No. 6,115,693 to *McDonough et al.*

The dependent claims should be allowable for the reasons that will be set forth with regard to the independent claims. Accordingly,

Claims 1-10 stand or fall together;

Claims 11 and 16 stand or fall together;

Claims 17-20 and 22 stand or fall together;

Claim 21 stands or falls alone;

Claims 25-27 stand or fall together; and

Claims 28-32 stand or fall together.

In order to establish a *prima facie* case of obviousness, the Examiner must provide: (1) One or more references; (2) that were available to the inventor; and (3) that teach (4) a suggestion to combine or modify the references; (5) the combination or modification of which would appear to be sufficient to have made the claimed invention obvious to one of ordinary skill in the art.

It would not be obvious to combine *Murad et al.* with *McDonough et al.* because (1) even if the references could be combined, the combination would fail to meet all the limitations of the claims, and (2) there is no teaching or suggestion that would motivate one of ordinary skill in the art to combine the references.

The *McDonough et al.* reference fails to cure *Murad et al.'s* deficiencies as discussed below. *McDonough et al.* relates to quality centers for a virtual sales and service center.

Additionally, insufficient evidence has been provided as to why one of ordinary skill in the art would have been motivated to select the references and combine them. Attention is directed to *In re Sang-Su Lee*, 61 USPQ2d 1430 (Fed. Cir. 2002). The factual inquiry whether to combine references must be thorough and searching. It must be based on objective evidence of record.

In rejecting claims under 35 U.S.C. § 103, it is incumbent upon the Examiner to establish a factual basis to support the legal conclusion of obviousness. See *In re Fine*, 837 F.2d 1071, 1073, 5 USPQ2d 1596, 1598 (Fed. Cir. 1988). In so doing, the Examiner is expected to make the factual determinations set forth in *Graham v. John Deere Co.*, 383 U.S. 1, 17, 148 USPQ 459, 467 (1966), and to provide a reason why one having ordinary skill in the pertinent art would have been led to modify the prior art or to combine

prior art references to arrive at the claimed invention. Such reasons must stem from some teachings, suggestions, or implications in the prior art as a whole or knowledge generally available to one having ordinary skill in the art. *Uniroyal, Inc. v. Rudkin-Wiley Corp.*, 837 F.2d 1044, 1051, 5 USPQ2d 1434, 1438 (Fed. Cir.), cert. denied, 488 U.S. 825 (1988); *Ashland Oil, Inc. v. Delta Resins & Refractories, Inc.*, 776 F.2d 281, 293, 227 USPQ 657, 664 (Fed. Cir. 1985), cert. denied, 475 U.S. 1017 (1986); *ACS Hosp. Sys., Inc. v. Montefiore Hosp.*, 732 F.2d 1572, 1577, 221 USPQ 929, 933 (Fed. Cir. 1984). These showings by the examiner are an essential part of complying with the burden of presenting a *prima facie* case of obviousness. See *In re Oetiker*, 977 F.2d 1443, 1445, 24 USPQ2d 1443, 1444 (Fed. Cir. 1992).

Evidence of a suggestion to combine may flow from the prior art references themselves, from the knowledge of one skilled in the art, or from the nature of the problem to be solved. However, this range of sources does not diminish the requirement for actual evidence. Further, the showing must be clear and particular. See *In re Dembiczak*, 175 F.3d 994, 998, 50 USPQ2d 1614, 1616 (Fed. Cir. 1999).

The Examiner has suggested some reasons (see September 15, 2004 Office Action): to incorporate OLAP into the *Murad et al.* patent with the motivation of accurately analyzing trends in a telecommunications environment. However, these needs are met by *Murad et al.* alone.

Here the Examiner has failed to establish one or more references available to the inventor that teach a suggestion to combine or modify the references to achieve the use of an OLAP based scalable profiling engine into a customer profiling apparatus that uses data cubes, calling pattern cubes, and similarity cubes, with sub-cubes treated as a bag and cell-wise comparison results are summarized based on bas overlap (where a sub-cub is treated as a bag). The combination or modification would not appear to be sufficient to have made the claimed invention obvious to one of ordinary skill in the art. Furthermore, the Examiner has impermissibly used hindsight analysis in combining these references.

Claim 1

Claim 1 recites, in part, at least one computer program, performed by the profiling engine, and operative to define behavior profiles defined at least in part by probability distributions, using data from the telephone call records, as data cubes and derive similarity measures on patterns extracted from the behavior profiles.

Claim 1 also recites, in part, wherein the behavior profiles are provided as two input calling pattern cubes, C_1 and C_2, and a similarity cube, C_s, is an output of a comparison between C_1 and C_2, wherein the similarity cube, C_s, represents a pair of corresponding sub-cubes of C_1 and C_2.

Claim 1 further recites, in part, wherein C_1 and C_2 are count-cubes, a sub-cube is treated as a bag, and cell-wise comparison results are summarized based on bag overlap, the count-cubes having non-negative integer cell values, and the bag overlap enables comparison of corresponding sub-cubes of distinct count-cubes.

With regard to claim 1, the Examiner has incorrectly asserted in the Office Action mailed September 15, 2004, that *Murad* teaches "...at least one computer program, performed by the profiling engine, and operative to define behavior profiles defined at least in part by probability distributions, using data from the telephone call records, as data cubes and derive similarity measures on patterns extracted from the behavior profiles (col. 8, lines 61-65, col. 10, lines 24-36) represented by the method being computer implemented, and where the behavior profiles are represented by prototypical first behavior profiles and similarity measures are represented by matches and differences, col. 5, lines 10-14, where the profile 304 is shown to represent a multi-dimensional probability distribution of calls)...".

Contrary to the Examiner's assertion, *Murad* does not teach the use of data from telephone call records configured as data cubes. In contrast, Applicants' technique represents data by multidimensional cubes via hierarchical dimensions and measures. Furthermore, OLAP scripts as a high-level language for multi-dimensional, multi-level data mining. Customer profiles, patterns, similarity measures, and association rules can be modeled as cubes. See originally filed application, page 31, lines 1-33, and page 36, lines 32-45. An

OLAP server then efficiently computes these items using cube operations via the OLAP server. OLAP implementation enables multi-dimensional, multi-level analysis over cubes providing enhanced expressive power (*e.g.*, richer association rules) by integrating OLAP style drill down, rollup operations with data mining tasks. Applicants' technique represents association rules as cubes which can be generated by cube operations, can be maintained as cube cells, and is scalable to large data sets. Furthermore, the technique allows definition of new kinds of multilevel, multidimensional association rules with enhanced expressive power. *Murad* does not teach or suggest such multidimensional, multi-level data mining techniques. The prior art of record deals with one similarity function. See originally filed application, page 27, lines 26-31, through page 30, line 32. The Examiner is simply wrong. Applicants' technique performs operations on data cubes, *Murad* does not perform operations on data cubes, and the associated claim limitations found in independent claim 1 are not taught or suggested by *Murad*.

The Examiner also asserts in the Office Action mailed September 15, 2004, that *Murad* teaches "...wherein the behavior profiles are provided as two input calling pattern cubes, C_1 and C_2, and a similarity cube, C_S, is an output of a comparison between C_1 and C_2, wherein the similarity cube C_S, represents a pair of corresponding sub-cubes of C_1 and C_2 (col. 8, lines 15-20, where the two input calling pattern cubes are represented by two instances of the second level profile where the second level profile represents extracted call prototypes)." Applicants' technique uses an OLAP server to provide memory management and efficient computation over data cubes, with OLAP servers functioning as data summarization engines within a computational pipeline. Association rules are represented as cubes which can be generated by cube operations, can be maintained as cube cells, and can be scalable to large data sets. Furthermore, Applicants' technique allows for definition of new kinds of multilevel, multidimensional association rules with enhanced expressive power when performing data mining. *Murad* simply does not teach or suggest these features; namely, a data warehouse and OLAP server based profiling engine architecture.

The Examiner further asserts in the Office Action mailed September 15, 2004, that *Murad* teaches "...and wherein C_1 and C_2 are count-cubes, a sub-cube is treated as a bag, and cell-wise comparison results are summarized based on bag overlap, wherein each cell of C_S represents the similarity of a pair of corresponding sub-cubes, a cube having a set of dimensions and each cell of the cube being identified by a value from each of the dimensions, (col. 7, lines 3-57, [where it shows that a comparison between qualitative profiles of a daily prototype and of the daily profile under examination as determined on the basis of the CD distance function. In this case, the Diff value represents each cell of Cs since it shows how similar/different the qualitative profiles of a daily prototype, which are derived from instances of a second level profile. This comparison, showing the distance factor represents the bag overlap. The overlap is shown by this distance factor since it is shown that the distance stays at or below the predetermined threshold])." Applicants disagree. *Murad* simply does not teach or suggest these features; namely, count-cubes, sub-cubes, and bag overlap. *Murad* does not teach efficient computation over data cubes. A distance factor is not the same as bag overlap (nor an obvious modification thereof). The Examiner has failed to teach or suggest Applicants' claimed feature.

The Examiner then asserts in the Office Action mailed September 15, 2004, that *Murad* does not teach "...an On Line Analytical Processing (OLAP) based scalable profiling engine communicating with the data warehouse and operative to build and update customer behavior profiles by mining the customer telephone call records that flow into the data warehouse, (col. 11, lines 29-34, and col. 12, lines 50-53, where the statistics represent the customer profiles).". The Examiner then asserts that *McDonough, et al.* teaches this claimed feature. The Examiner then asserts that it would have been obvious to one of ordinary skill in the art at the time the invention was made to incorporate OLAP into the *Murad* patent with the modification of accurately analyzing trends in a telecommunications environment.

Applicants disagree with the Examiner's assertion. First, *McDonough* does not teach the implementation of an "...OnLine Analytical Processing (OLAP) based scalable profiling engine communicating with a data

warehouse and operative to build and update customer behavior profiles by mining the customer telephone call records that flow into the data warehouse ...". Furthermore *McDonough* does not teach "...the behavior profiles are provided as two input calling pattern cubes, C_1 and C_2, and a similarity cube, C_S, is an output of a comparison between C_1 and C_2, wherein the similarity cube, C_S, represents a pair of corresponding sub-cubes of C_1 and C_2, and wherein C_1 and C_2 are count-cubes, a sub-cube is treated as a bag, and cell-wise comparison results are summarized based on bag overlap, the count-cubes having non-negative integer call values, and the bag overlap enables comparison of corresponding sub-cubes of distinct count-cubes."

Instead, *McDonough* merely teaches or suggests the incorporation of an OLAP tool (see col. 11, line 33) into a quality center for a virtual sales and service center, and the incorporation of OLAP capabilities into such a quality center to enable quality center executives to gather performance information and analyze trends and statistics for operational management of the virtual environment (see col. 12, lines 50-54).

In view of the above, claim 1 presents patentable subject matter.

Claim 11

Claim 11 recites, in part, a profiling engine configured to communicate with the data warehouse and operative to generate customer telephone calling behavior profiles from the customer records within the data warehouse, the profiling engine being configured to define customer telephone calling behavior profiles using probability distributions, and to compute the customer telephone calling behavior profiles using OLAP operations on multi-dimensional and multi-level data cubes, one multi-level data cube being a profile cube, another multi-level data cube being a profile-snapshot cube, and yet another data cube being a profile cube formed by merging together the profile cube and the profile-snapshot cube.

Claim 11 also recites, in part, a computer application program implemented on the profiling engine and operative to represent behavior profiles as patterns, using the telephone call data, and derive similarity measures of the patterns usable to profile customer behavior and detect fraud by deriving calling

pattern cubes from the profile cubes using a probability distribution-based calling pattern, treating a sub-cube as a bag, and summarizing cell-wise comparison results based on bag overlap.

In the Office Action, the Examiner asserts that *Murad et al.* discloses a profiling engine configured to communicate with a data warehouse and operative to generate customer calling behavior profiles from the customer record within the data warehouse. Notwithstanding such assertion, the *Murad et al.* reference nevertheless fails to teach or suggest finding customer telephone calling behavior profiles using probability distributions, and to compute the customer telephone calling behavior profiles as using OLAP operations on multi-dimensional or multi-level data cubes, with one multi-level data cube being a profile cube, another multi-level data cube being a profile-snapshot cube, and yet another data cube being a profile cube formed by merging together the profile cube and the profile-snapshot cube.

In the Office Action, the Examiner further asserts that *Murad et al.* teaches a computer application program that represents behavior profiles as patterns and derived similarity measures of the patterns usable to profile customer behavior and detect fraud, by driving calling pattern cubes from the profile cubes (see col. 8, lines 61-66; col. 10, lines 30-39). Notwithstanding such assertion, the *Murad et al.* reference nevertheless fails to teach or suggest deriving similarity measures of the patterns usable to profile customer behavior and detect fraud, by deriving calling pattern cubes from the profile cubes.

In the Office Action, the Examiner further asserts that *Murad et al.* fails to disclose the computing of customer telephone calling behavior profiles using the OLAP operations, but that *McDonough et al.* discloses such feature at col. 11, lines 29-34, and col. 12, lines 50-53. The Examiner then asserts it would have been obvious to one of ordinary skill in the art at the time of the invention to incorporate OLAP into the *Murad et al.* patent with the motivation of accurately analyzing trends in the telecommunications environment. However, these needs are met by *Murad et al.* alone.

Therefore, the combination of references is improper and should be reversed.

Claim 17

Claim 17 recites, in part, generating a profile-snapshot cube accommodating multiple customers; in combination with generating the profile-snapshot cube, generating a profile cube for the same set of customers from the data warehouse.

In the Office Action, the Examiner asserts that *Murad et al.* shows the generating of a profile-snapshot cube and the generating of a profile cube (see col. 10, lines 24-25, and col. 10, lines 26-37). However, *Murad et al.* in its corresponding text failed to teach or suggest the generating of a profile-snapshot cube to accommodate multiple customers in combination with generating a profile cube for the same set of customers from the data warehouse.

In view of the above, claim 17 presents additional patentable subject matter.

Claim 21

Claim 21 recites, in part, retrieving profile tables to generate the profile cubes, retrieving call data tables to create profile-snapshot cubes that have the same dimension of a profile cube to facilitate merging by addition, deriving individual customer-based calling pattern cubes from the profile cubes, analyzing individual calling patterns and multiple dimensions and multiple levels, and computing a similarity of calling patterns that belong to different customers or to a same customer over different profiling periods. In the Office Action, the Examiner asserts that *Murad et al.* discloses the retrieving of profile tables to generate profile cubes (see col. 4, lines 36-48, and Figure 2B); retrieving call data tables to create profile-snapshot cubes that have a same dimension of a profile cube to facilitate merging by addition (see col. 10, lines 24-25); deriving individual customer-based calling pattern cubes from the profile cubes (see col. 8, lines 15-20); analyzing individual calling patterns in multiple dimensions and multiple levels, and computing a similarity of calling patterns that belong to different customers or to a same customer over different profiling periods (see col. 10, lines 30-37). *Murad et al.* fails to teach or suggest any of these steps in conjunction with generating profile cubes, creating profile-snapshot cubes,

merging the cubes together by addition, deriving individual customer-based calling pattern cubes from the profile cubes, analyzing individual calling patterns and multiple dimensions and multiple levels, and computing a similarity of calling patterns that belong to different customers or to a same customer over different profiling periods.

In view of the above, claim 21 presents additional patentable subject matter.

Claim 25

Claim 25 recites, in part, a computer application program implemented on the profiling engine and operative to represent behavior profiles as patterns, using the telephone call data, and derive similarity measures of the patterns usable to profile customer behavior and detect fraud by deriving volume based calling pattern cubes comprising count-cubes from the profile cubes using a probability distribution-based calling pattern.

Claim 25 further recites, in part, treating a sub-cube as a bag, and summarizing cell-wise comparison results based on bag overlap using cell-to-subcube mapping, the count-cubes having non-negative integer cell values, and the bag overlap enables comparison of corresponding sub-cubes of distinct count-cubes.

In the Office Action, the Examiner asserts that *Murad et al.* teaches deriving volume-based calling pattern cubes comprising count-cubes from profile cubes (see col. 8, line 61-66, and col. 10, lines 30-39). Furthermore, the Examiner asserts that *Murad et al.* teaches obtaining of call similarities or dissimilarities from the first level profile (see col. 4, lines 40-45). Even furthermore, the Examiner asserts that *Murad et al.* teaches, using a probability distribution-based calling pattern, treating a sub-cube as a bag, and summarizing cell-wise comparison results based on bag overlap using cell-to-subcube mapping (see col. 7, lines 58-65, and col. 8, lines 10-20), with a distance factor based on the cumulative distribution as determined (see col. 5, line 52, through col. 6, line 5). The Examiner asserts that the distance factor based on cumulative distribution represents bag overlap using probability distribution-based calling patterns since, when calculating distance factor, if the

value is negative, then the daily profiles (represented by cells) would overlap. However, *Murad et al.* does not teach the deriving of volume-based calling pattern cubes comprising count-cubes, nor summarizing cell-wise comparison results based on bag overlap using cell-to-subcube mapping, with count-cubes having non-integer cell values and the bag overlap enabling comparison of corresponding sub-cubes of distinct count-cubes.

In view of the above, claim 25 presents additional patentable subject matter.

As claims 26 and 27 depend on claim 25, they too are allowable.

Claim 28

Claim 28 recites, in part, at least one computer program, performed by the profiling engine, and operative to define behavior profiles defined at least in part by probability distributions, using data from the telephone call records, as data cubes and derive similarity measures on patterns extracted from the behavior profiles.

Claim 28 also recites, in part, wherein the behavior profiles are provided as two input calling pattern cubes, C_1 and C_2, and a similarity cube, C_s, is an output of a comparison between C_1 and C_2, wherein the similarity cube, C_s, represents a pair of corresponding sub-cubes of C_1 and C_2.

Claim 28 further recites, in part, wherein C_1 and C_2 are count-cubes, a sub-cube is treated as a bag, and cell-wise comparison results are summarized based on bag overlap, wherein each cell of C_s represents the similarity of a pair of corresponding sub-cubes, a cube having a set of dimensions and each cell of the cube being identified by a value from each of the dimensions.

With regard to claim 28, the Examiner has incorrectly asserted in the Office Action mailed September 15, 2004, that *Murad* teaches "...at least one computer program, performed by the profiling engine, and operative to define behavior profiles defined at least in part by probability distributions, using data from the telephone call records, as data cubes and derive similarity measures on patterns extracted from the behavior profiles (col. 8, lines 61-65, col. 10, lines 24-36) represented by the method being computer implemented,

and where the behavior profiles are represented by prototypical first behavior profiles and similarity measures are represented by matches and differences, col. 5, lines 10-14, where the profile 304 is shown to represent a multi-dimensional probability distribution of calls)...".

Contrary to the Examiner's assertion, *Murad* does not teach the use of data from telephone call records configured as data cubes. In contrast, Applicants' technique represents data by multidimensional cubes via hierarchical dimensions and measures. Furthermore, OLAP scripts as a high-level language for multi-dimensional, multi-level data mining. Customer profiles, patterns, similarity measures, and association rules can be modeled as cubes. See originally filed application, page 31, lines 1-33; page 36, lines 32-45. An OLAP server then efficiently computes these items using cube operations via the OLAP server. OLAP implementation enables multi-dimensional, multi-level analysis over cubes providing enhanced expressive power (*e.g.*, richer association rules) by integrating OLAP style drill down, rollup operations with data mining tasks. Applicants' technique represents association rules as cubes which can be generated by cube operations, can be maintained as cube cells, and is scalable to large data sets. Furthermore, the technique allows definition of new kinds of multilevel, multidimensional association rules with enhanced expressive power. *Murad* does not teach or suggest such multidimensional, multi-level data mining techniques. See originally filed application, page 27, lines 26-31, through page 30, line 32. The Examiner is simply wrong. Applicants' technique performs operations on data cubes, *Murad* does not perform operations on data cubes, and the associated claim limitations found in independent claim 28 is not taught or suggested by *Murad*.

The Examiner also asserts in the Office Action mailed September 15, 2004, that *Murad* teaches "...wherein the behavior profiles are provided as two input calling pattern cubes, C_1 and C_2, and a similarity cube, C_S, is an output of a comparison between C_1 and C_2, wherein the similarity cube C_S, represents a pair of corresponding sub-cubes of C_1 and C_2, (col. 8, lines 15-20, where the two input calling pattern cubes are represented by two instances of the second level profile where the second level profile represents extracted call prototypes)." Applicants' technique uses an OLAP server to provide memory

management and efficient computation over data cubes, with OLAP servers functioning as data summarization engines within a computational pipeline. Association rules are represented as cubes which can be generated by cube operations, can be maintained as cube cells, and can be scalable to large data sets. Furthermore, Applicants' technique allows for definition of new kinds of multilevel, multidimensional association rules with enhanced expressive power when performing data mining. *Murad* simply does not teach or suggest these features; namely, a data warehouse and OLAP server based profiling engine architecture.

The Examiner further asserts in the Office Action mailed September 15, 2004, that *Murad* teaches "...and wherein C_1 and C_2, are count-cubes, a sub-cube is treated as a bag, and cell-wise comparison results are summarized based on bag overlap, wherein each cell of C_S represents the similarity of a pair of corresponding sub-cubes, a cube having a set of dimensions and each cell of the cube being identified by a value from each of the dimensions, (col. 7, lines 3-57, [where it shows that a comparison between qualitative profiles of a daily prototype and of the daily profile under examination as determined on the basis of the CD distance function. In this case, the Diff value represents each cell of C_S since it shows how similar/different the qualitative profiles of a daily prototype, which are derived from instances of a second level profile. This comparison, showing the distance factor represents the bag overlap. The overlap is shown by this distance factor since it is shown that the distance stays at or below the predetermined threshold])." Applicants disagree. *Murad* simply does not teach or suggest these features; namely, count-cubes, sub-cubes, and bag overlap. *Murad* does not teach efficient computation over data cubes. A distance factor is not the same as bag overlap (nor an obvious modification thereof). The Examiner has failed to teach or suggest Applicants' claimed feature.

The Examiner then asserts in the Office Action mailed September 15, 2004, that *Murad* does <u>not</u> teach "...an On Line Analytical Processing (OLAP) based scalable profiling engine communicating with the data warehouse and operative to build and update customer behavior profiles by mining the customer telephone call records that flow into the data warehouse,

(col. 11, lines 29-34, and col. 12, lines 50-53, where the statistics represent the customer profiles).". The Examiner then asserts that *McDonough et al.* teaches this claimed feature. The Examiner then asserts that it would have been obvious to one of ordinary skill in the art at the time the invention was made to incorporate OLAP into the *Murad* patent with the modification of accurately analyzing trends in a telecommunications environment.

Applicants disagree with the Examiner's assertion. First, *McDonough* does not teach the implementation of an "...OnLine Analytical Processing (OLAP) based scalable profiling engine communicating with a data warehouse and operative to build and update customer behavior profiles by mining the customer telephone call records that flow into the data warehouse ...". Furthermore *McDonough* does not teach "...the behavior profiles are provided as two input calling pattern cubes, C_1 and C_2, and a similarity cube, C_S, is an output of a comparison between C_1 and C_2, wherein the similarity cube, C_S, represents a pair of corresponding sub-cubes of C_1 and C_2, and wherein C_1 and C_2 are count-cubes, a sub-cube is treated as a bag, and cell-wise comparison results are summarized based on bag overlap, the count-cubes having non-negative integer call values, and the bag overlap enables comparison of corresponding sub-cubes of distinct count-cubes."

Instead, *McDonough* merely teaches or suggests the incorporation of an OLAP tool (see col. 11, line 33) into a quality center for a virtual sales and service center, and the incorporation of OLAP capabilities into such a quality center to enable quality center executives to gather performance information and analyze trends and statistics for operational management of the virtual environment (see col. 12, lines 50-54).

In view of the above, claim 28 presents patentable subject matter.

In view of the foregoing, reversal of the final rejection of claims 1, 3-4, 6-7, 9-11, 16-22 and 25-32 is requested.

Respectfully submitted,

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IN THE UNITED STATES PATENT AND TRADEMARK OFFICE
BOARD OF PATENT APPEALS AND INTERFERENCES

INVENTOR(S): Qiming Chen, et al.

SERIAL NO.: 09/464,311 **GROUP ART UNIT:** 3623

FILED: December 15, 1999 **EXAMINER:** A.K. Robinson Boyce

SUBJECT: "Customer Profiling Apparatus for Conducting Customer Behavior Pattern Analysis, and Method for Comparing Customer Behavior Patterns"

Appendix

The claims involved in the appeal are as follows:

1. A customer profiling apparatus for conducting customer telephone behavior pattern analysis on telephone call records including telephone call data, comprising:

processing circuitry operative to process customer telephone call records;

a data warehouse coupled with the processing circuitry and configured to store the processed customer telephone call records;

an OnLine Analytical Processing (OLAP) based scalable profiling engine communicating with the data warehouse and operative to build and update customer behavior profiles by mining the customer telephone call records that flow into the data warehouse; and

at least one computer program, performed by the profiling engine, and operative to define behavior profiles defined at least in part by probability distributions, using data from the telephone call records, as data cubes and derive similarity measures on patterns extracted from the behavior profiles;

wherein the behavior profiles are provided as two input calling pattern cubes, C_1 and C_2, and a similarity cube, C_s, is an output of a comparison between C_1 and C_2, wherein the similarity cube, C_s, represents a pair of corresponding sub-cubes of C_1 and C_2, and wherein C_1 and C_2 are count-cubes,

a sub-cube is treated as a bag, and cell-wise comparison results are summarized based on bag overlap, the count-cubes having non-negative integer cell values, and the bag overlap enables comparison of corresponding sub-cubes of distinct count cubes.

3. The apparatus of claim 1 wherein the profiling engine comprises a commercial data warehouse server and a multi-dimensional OLAP server.

4. The apparatus of claim 1 wherein the profiling engine implements multi-level, multi-dimensional pattern analysis and comparison.

6. The apparatus of claim 1 wherein similarity measures are defined and computed on the patterns extracted from the behavior profiles.

7. The apparatus of claim 1 wherein the computer program is further operative to compare the data cubes with similarity measures identifying fraud so as to extract fraud detection from the behavior profiles.

9. The apparatus of claim 1 wherein the behavior profiles are analyzed against a personalized threshold to detect caller fraud.

10. The apparatus of claim 1 wherein the customer records comprise customer call records, the profiling engine builds and updates customer calling behavior profiles by mining the customer call records, and the computer program derives similarity measures on patterns extracted from the call behavior profiles.

11. A profiling apparatus, comprising:

a data warehouse for storing customer records including telephone call data;

a profiling engine configured to communicate with the data warehouse and operative to generate customer telephone calling behavior profiles from the customer records within the data warehouse, the profiling engine being configured to define customer telephone calling behavior profiles using probability distributions, and to compute the customer telephone calling behavior profiles using OLAP operations on multi-dimensional and multi-level data cubes, one multi-level data cube being a profile cube, another multi-level data cube being a profile-snapshot cube, and yet another data cube being a profile cube formed by merging together the profile cube and the profile-snapshot cube; and

a computer application program implemented on the profiling engine and operative to represent behavior profiles as patterns, using the telephone call data, and derive similarity measures of the patterns usable to profile customer behavior and detect fraud by deriving calling pattern cubes from the profile cubes using a probability distribution-based calling pattern, treating a sub-cube as a bag, and summarizing cell-wise comparison results based on bag overlap.

16. The apparatus of claim 11 wherein the updated profile cube is stored within a profile table of the data warehouse such that subsequent customer profiling utilizes customer records from the data warehouse comprising the updated profile cube.

17. A method for comparing customer behavior patterns, comprising:

providing call data in the form of call data records to a data warehouse;

loading the call data records into a multidimensional database of an OLAP server;

maintaining profiles by staging data between the data warehouse and the OLAP multidimensional database;

generating a profile-snapshot cube accommodating multiple customers;

in combination with generating the profile-snapshot cube, generating a profile cube for the same set of customers from the data warehouse;

updating the profile cube by merging the profile cube with the profile-snapshot cube;

storing the updated profile cube in the data warehouse; and

deriving similarity measures of patterns usable to profile customer behavior and detect fraud by deriving calling pattern cubes from the updated profile cube using a probability distribution-based calling pattern, treating a sub-cube as a bag, and summarizing cell-wise comparison results based on bag overlap.

18. The method of claim 17 wherein the data warehouse comprises profile tables configured to store the profile cube.

19. The method of claim 17 wherein the updated profile cube is subdivided into a plurality of individual calling pattern cubes, each representative of individual customers, and further comprising comparing calling patterns that have been derived from customer calling behavior profiles.

20. The method of claim 19 further comprising the steps of reporting, analyzing, and visualizing of one of the calling pattern cubes for an individual customer.

21. The method of claim 19 further comprising retrieving profile tables to generate the profile cubes, retrieving call data tables to create profile-snapshot cubes that have a same dimension of a profile cube to facilitate merging by addition, deriving individual customer-based calling pattern cubes from the profile cubes, analyzing individual calling patterns in multiple dimensions and multiple levels, and computing a similarity of calling patterns

that belong to different customers or to a same customer over different profiling periods.

22. The apparatus of claim 1 wherein a cell of C_S is mapped into a pair of corresponding sub-cubes of C_1 and C_2.

25. A profiling apparatus, comprising:

a data warehouse for storing customer records including telephone call data;

a profiling engine configured to communicate with the data warehouse and operative to generate customer telephone calling behavior profiles from the customer records within the data warehouse, the profiling engine being configured to define customer telephone calling behavior profiles using probability distributions, and to compute the customer telephone calling behavior profiles using OLAP operations on multi-dimensional and multi-level data cubes, one multi-level data cube being a profile cube, another multi-level data cube being a profile-snapshot cube, and yet another data cube being a profile cube formed by merging together the profile cube and the profile-snapshot cube; and

a computer application program implemented on the profiling engine and operative to represent behavior profiles as patterns, using the telephone call data, and derive similarity measures of the patterns usable to profile customer behavior and detect fraud by deriving volume based calling pattern cubes comprising count-cubes from the profile cubes using a probability distribution-based calling pattern, treating a sub-cube as a bag, and summarizing cell-wise comparison results based on bag overlap using cell-to-subcube mapping, the count cubes having non-negative integer cell values, and the bag overlap enables comparison of corresponding sub-cubes of distinct count cubes.

26. The apparatus of claim 25 wherein the computer application program is operative to implement projection cell-to-subcube mapping.

27. The apparatus of claim 25 wherein the computer application program is operative to implement change level cell-to-subcube mapping.

28. A customer profiling apparatus for conducting customer telephone behavior pattern analysis on telephone call records including telephone call data, comprising:

processing circuitry operative to process customer telephone call records;

a data warehouse coupled with the processing circuitry and configured to store the processed customer telephone call records;

an OnLine Analytical Processing (OLAP) based scalable profiling engine communicating with the data warehouse and operative to build and update customer behavior profiles by mining the customer telephone call records that flow into the data warehouse; and

at least one computer program, performed by the profiling engine, and operative to define behavior profiles defined at least in part by probability distributions, using data from the telephone call records, as data cubes and derive similarity measures on patterns extracted from the behavior profiles;

wherein the behavior profiles are provided as two input calling pattern cubes, C_1 and C_2, and a similarity cube, C_s, is an output of a comparison between C_1 and C_2, wherein the similarity cube, C_s, represents a pair of corresponding sub-cubes of C_1 and C_2, and wherein C_1 and C_2 are count-cubes, a sub-cube is treated as a bag, and cell-wise comparison results are summarized based on bag overlap, wherein each cell of C_s represents the similarity of a pair of corresponding sub-cubes, a cube having a set of dimensions and each cell of the cube being identified by a value from each of the dimensions.

29. The apparatus of claim 28, wherein an element of the bag is identified by a list of dimension values underlying a cell of the cube, and a count of the element is represented by a cell value.

30. The apparatus of claim 28, wherein the count cubes having non-negative integer cell values, and the bag overlap enables comparison of corresponding sub-cubes of distinct count cubes.

31. The apparatus of claim 28, wherein each cell of C_s represents the similarity of a pair of corresponding sub-cubes.

32. The apparatus of claim 1, wherein each cell of C_s represents the similarity of a pair of corresponding sub-cubes.